Housemod User Guide, December 2014

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Introduction

NATSEM has developed an online microsimulation model of housing in Australia as an e-Research tool. Housemod is a spatial microsimulation modelling tool for analysing housing policy and housing affordability outcomes for Australia and its regions. The model combines ABS Census, survey and demographic projections to accurately replicate the current and future regional housing markets. Housemod includes very detailed data at a regional level on the demographic, social and economic circumstances of households. The model is capable of altering demographic, economic and government policy assumptions and considering potential outcomes for both today and future years.

Housemod operationalizes the following variables for base, scenario (simulation) and projections data analysis:

1) Rent growth (state level)
2) House prices (state level)
3) Mortgages linked with interest rates
4) Commonwealth Rent Assistance (CRA) maximum rates, minimum rent levels
5) Household income growth (state level)
6) Demographic change – population growth (state level)

These variables have default values for the base model but the interface allows the user to alter these variables to enable scenario analysis. As an example, the user

could increase the assumed rate of rent price growth by state region into the future and annual tables could be outputted at a regional or aggregated level for rent stress providing the base results and simulated results. Using the AURIN portal's mapping facilities these results can be mapped and analysed.
With an interface providing detailed tabled small area outputs for the following variables for both the base world, alternative base worlds, scenarios and the difference between base and scenario (winners and losers):

1) Regional level housing stress rates – mortgage/rental/total for 2011 and out to the year 2027
2) Regional level poverty rates projected to 2027
3) Impact of Commonwealth Rent Assistance (CRA) on rent stress rates and impacts of CRA policy/levels for Australia's regions over the future years.
4) Estimates of total housing demand by small area level to 2027. This data can be compared with an associated data set that provides the current level of building approvals.
5) Affordability ratios at a small area level (house price to income) to 2027.
6) Impact of interest rate changes on mortgage stress rates at a regional and small area level.
7) Impacts of demographic changes on household demand and housing stress levels.

Housemod provides the user with both a set of base results and the ability to develop alternative results by simulating changes to key variables in the housing market such as rents and house prices but also policy variables such as CRA and interest rates. Housemod is a static microsimulation model which means that the results relate to the impact of change for the 'day after'. There is no dynamic or behavioural element to the model so the model does not attempt to model changes to economic behavior. The projections into the future are largely based on ABS population projections for each region and are not derived by NATSEM.

Housemod generates small areas estimates for housing stress, poverty, first home buyer shares and a range of other housing related variables by using a spatial microsimulation technique for deriving small area estimates. The methodology brings together ABS survey data and benchmarks this survey data for each region of Australia using small area ABS Census data.

Technical details about Housemod and appropriate use

Housemod is based largely on a spatial microsimulation model which combines ABS Census (2011) and ABS income survey data (Survey of Income and Housing). This combination provides very detailed results at the SA2 level. These results are then aggregated to SA3, SA4, state and national levels. Housemod is capable of projecting any year into the future to 2027. To enable the projections the model relies upon ABS projections and actual data at the SLA (Statistical Local Area)/SA2 level by age and sex. The model also updates dollar values such as income and housing variables by

appropriate inflators such as the expectation for CPI, rents, mortgages and incomes. The projections are hard coded into the interface but can be altered when running simulations.

The output variables, such as housing stress, poverty, underlying demand and rent levels are synthetically derived from the modelling process. The modelling process benchmarks to the following variables:

- Uses GREGWT.sas to reweight base population to targets.
- Age x Sex x Labour Force
- Non-school qualifications
- Occupation
- Tenure by income
- Dwelling structure by family type
- Mortgage ($/month) by household income
- Rent ($/wk) by Household income
- Tenure type by household type
- Tenure type by weekly rent
- House prices (medians)
- CRA households and (medians)

This ensures that most outputted variables are either in line with administration totals (CRA, house prices) or census aggregates for 2011. In some situations, such as rent stress or poverty the estimates are synthetic in that they are 'unconstrained' variables. Given that these variables are very closely related to the benchmark variables NATSEM would expect these regional estimates to provide very good estimates.

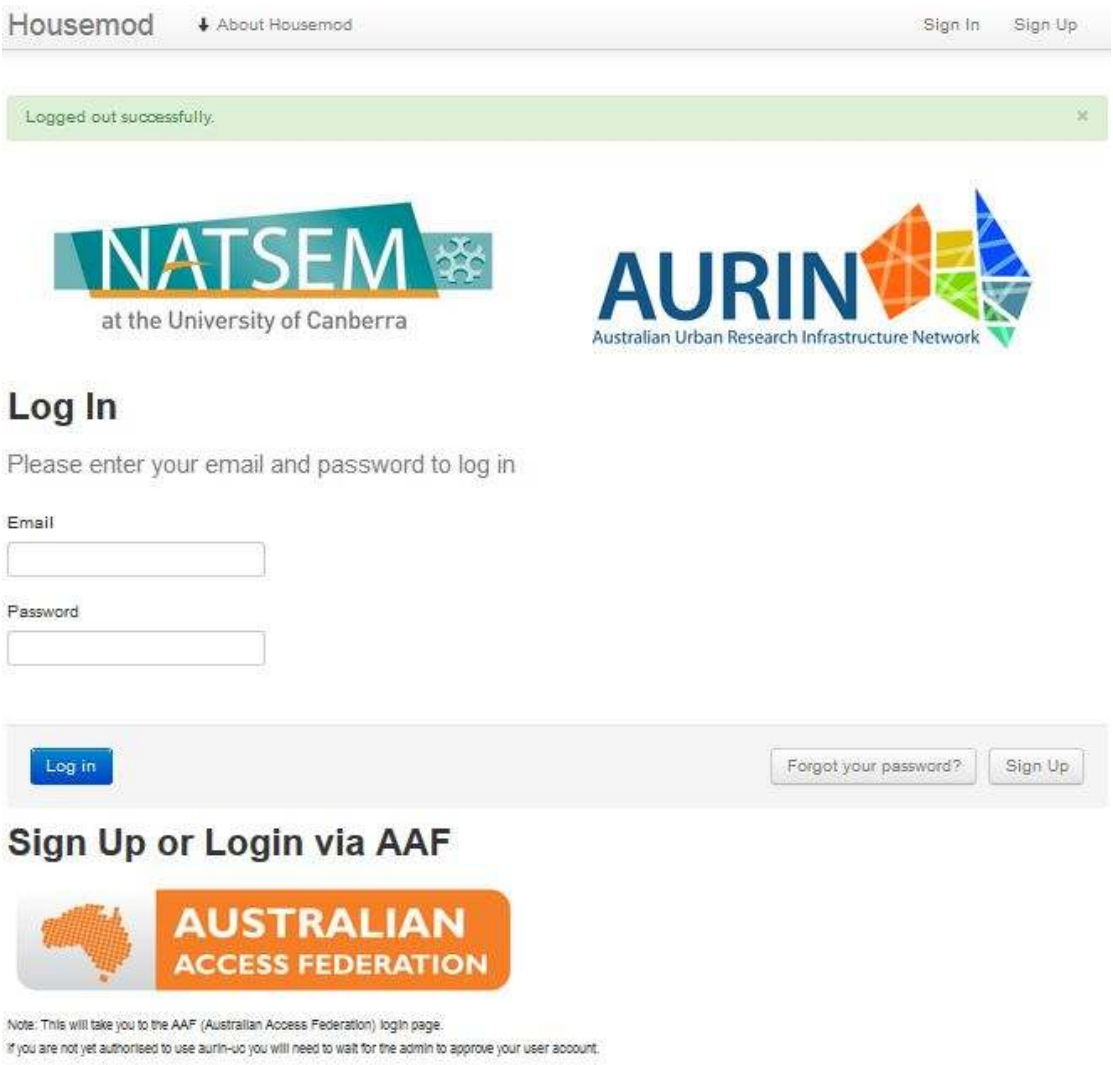
Housemod is a 'static' model and therefore any changes the user makes when simulating will not be influenced by a behavioural component. The results are often said to be 'day-after'. The modelling is a projections style model and should not be interpreted as a forecasting model. We assume in the base case that house prices will grow by 4 per cent per annum for example, this is a projection – not a forecast.

Users should be aware that as the model is only a projection or scenario based tool the user should be cautious of using unrealistic assumptions. As the model has no behavioural equations changing assumptions to one variable has no knock-on effect to other economic variables. For example, setting up high rent assumptions will not feed into impacts on other variables such as house prices or tenure choice. The development of such capabilities may be a project for the future.

The underlying Housemod model resides at the University of Canberra on secure servers. The separation between the interface and the server is such that that the user only has access to outputted spreadsheets and has no access to the underlying model code or data. This is a requirement of the Australian Bureau of Statistics with regard to the use of their Confidentialised Unit Record Files (CURF). As a further security measure access to Housemod is limited to approved users only. These users are university researchers and other users who are approved at the discretion of the University of Canberra and AURIN.

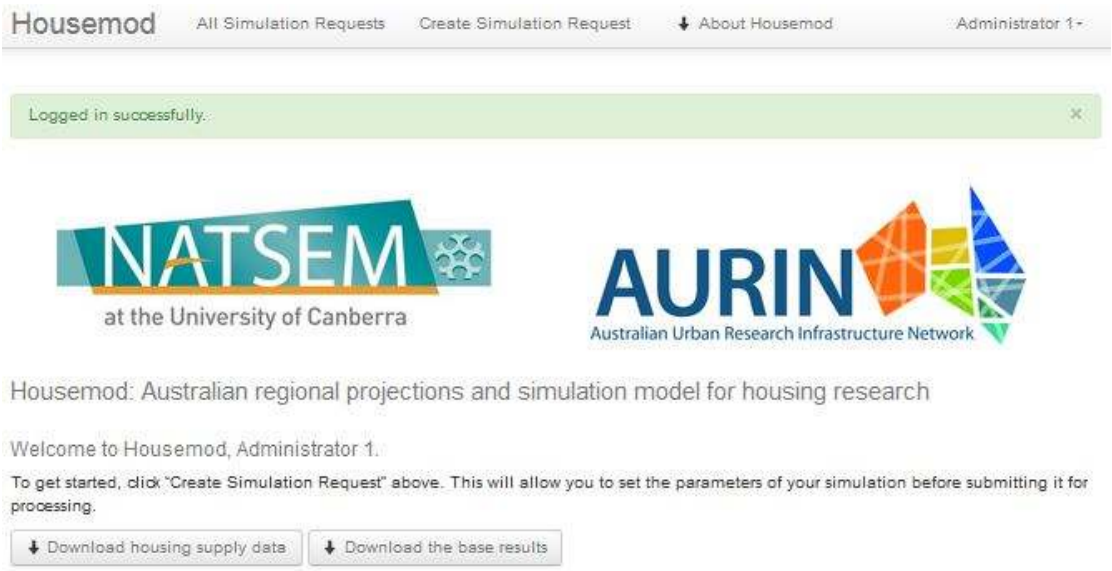
How to access Housemod

Housemod can be accessed by approved users at the following web address: https://ic2-aurin-uc-staging-vm.intersect.org.au/.


Housemod
About Housemod
Sign In
Sign Up
Logged out successfully.
NATSEM
at the University of Canberra
AURIN
Australian Urban Research Infrastructure Network
Log In
Please enter your email and password to log in
Email
Password
Log in
Forgot your password?
Sign Up
Sign Up or Login via AAF
AUSTRALIAN ACCESS FEDERATION
Note: This will take you to the AAF (Australian Access Federation) login page.
If you are not yet authorised to use aurin-uc you will need to wait for the admin to approve your user account.

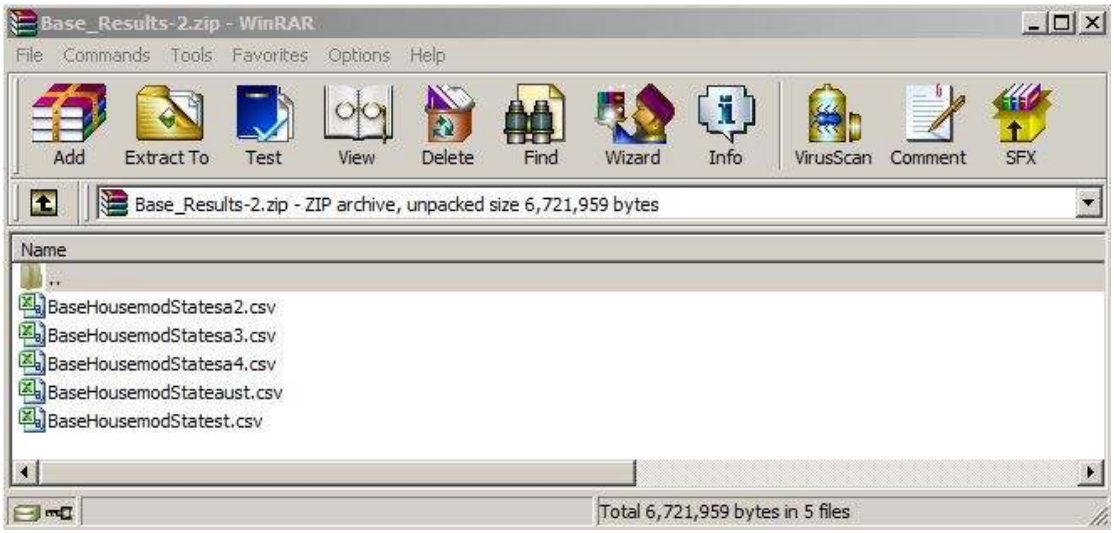
If you don't already have access then access can be arranged through the 'Sign-Up' button at the top right of the screen or through your login page via Australian Access Federation page. University researchers (those with a 'edu.au' email address) will gain access. Access beyond the university sector will be on a case-by-case basis.

Once logged onto Housemod the user will view the front page of Housemod from which pre-existing data can be downloaded or simulations requested.


Housemod
All Simulation Requests
Create Simulation Request
About Housemod
Administrator 1
Logged in successfully.
NATSEM
at the University of Canberra
AURIN
Australian Urban Research Infrastructure Network
Housemod: Australian regional projections and simulation model for housing research
Welcome to Housemod, Administrator 1.
To get started, click "Create Simulation Request" above. This will allow you to set the parameters of your simulation before submitting it for processing.
Download housing supply data
Download the base results

Base world Housemod results

NATSEM has developed a number of csv files that can be downloaded which represent the 'base world' of Housemod results. These files can be accessed by clicking on 'Download the base results' from the front page screen.



Contained within the zipped file are the base results from Housemod at various levels of geography (SA2.SA3,SA4,state and Australia). Each file contains summary information for a given region and year (2011 to 2027) for housing related data. This information covers:

1) Household numbers/annual demand for new households;
2) Disposable income;
3) First home buyer share – share of dwellings occupied by purchasers who purchased their first dwelling on the last three years[2];

[2] This variable is not constrained by administration data or validated in any other way and relies only on the ability of demographic and economic differences at a regional level to explain regional

4) Average housing costs per week for different tenure types;
5) Average house price (based on the weighted average of units and detached housing from APM data sourced elsewhere in the AURIN website);
6) House price to income ratios;
7) Housing stress measures and after-housing poverty rates.

Housing Supply data

NATSEM has developed a range of regional housing supply indicators for SA2 to national level. These can be downloaded via the 'downloading housing supply data' button.

Included in this data, for given regional levels is the following:

1) Annual financial year dwelling approvals (totals) (year 2001-02 to year 2013-14);
2) Dwelling number data for 2001 and 2011 (ABS Census information);
3) Population data;
4) Supply imbalance through 2001-02 to 2013-14;
5) Dwelling and population average annual growth through 2001-02 to 2013-14;
6) Supply imbalance ratio (supply shortage divided by stock);
7) Dwelling density.

The supply imbalance is calculated based on a comparison of the underlying demand for dwellings (population growth) compared to actual change in private dwellings.

Running a simulation

Housemod enables the user to run their own simulation to consider the impact of different economic, demographic and policy parameters.

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differences. NATSEM has less confidence in this variable than other variables provided and it should be used with caution.

Two types of simulations can be developed. Firstly the user should select the 'Create Simulation Request' selection at the top of the main screen tab. Under the 'Run Type' label there are two possible options – 'simulation' or 'Compare Simulation (2012 only)'.

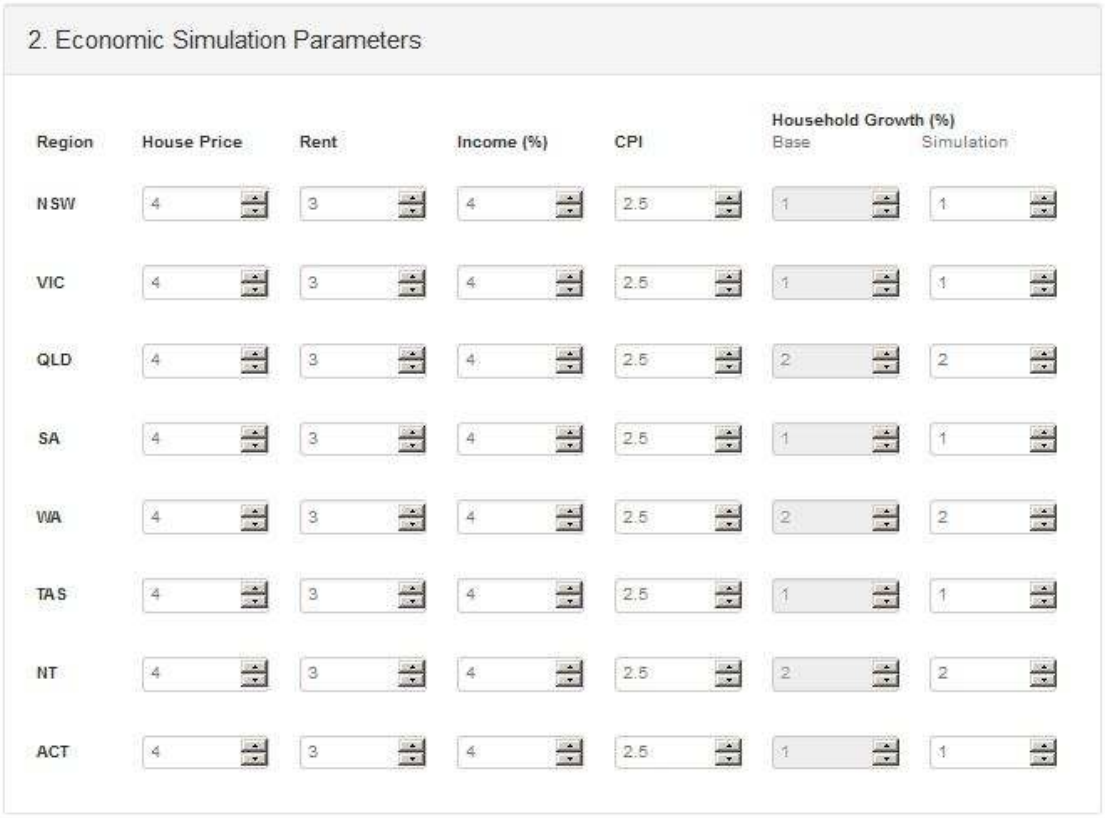
Simulation

The first option allows the user to develop a range of economic, social or demographic assumptions that deviate from the 'base world'. The user can choose the years for the simulation (Analysis start year/analysis end year). For example a start year of 2011 and an end year of 2017 will provide simulation results for 2011, 2012 and so on up to 2017. The user should be aware that each year is run separately and so the results will take proportionately longer to be fed back to the user the more years are chosen.

The policy variables than can be altered include the mortgage interest rate and Commonwealth Rent Assistance parameters. The default interest rate is 6 per cent and the base CRA parameters are provided on the 'Create Simulation Request' page under 'CRA Assumptions 2011'. The user can only change the minimum rent and maximum rent assistance allowable under the CRA rules. 'CRA Minimum Rent Change' allows the user increase or decrease the minimum rent for which a payment can be provided while 'CRA Maximum Rent Change' allows the maximum rent subsidy to be increased or decreased. The % change applies equally to different CRA categories (singles, couples and so on).

The economic and demographic parameters can be altered using the 'Economic Simulation Parameters' box. The default values for the 'base world' are provided and can be altered by the user for a simulation run. The parameters will be altered for each and every year at the same rate. The variables can't be altered for individual regions (such as SA2s) however they will be altered for all regions within the same state. This does mean that it is possible to increase any variable for regions within one state differently to another state.

The user can alter house prices, rent, income, CPI (inflation) and household growth rates. As a reminder, the simulation results are based on scenarios and don't represent forecasts and it should also be remembered that the results do not include any behavioural responses that could feasibly be expected from altered economic or demographic or policy change. The results are said to 'day-after' responses.


2. Economic Simulation Parameters
Region
House Price
Rent
Income (%)
CPI
Household Growth (%)
Base
Simulation
NSW 4 3 4 2.5 1 1
VIC 4 3 4 2.5 1 1
QLD 4 3 4 2.5 2 2
SA 4 3 4 2.5 1 1
WA 4 3 4 2.5 2 2
TAS 4 3 4 2.5 1 1
NT 4 3 4 2.5 2 2
ACT 4 3 4 2.5 1 1

To obtain results the user should hit the 'Submit Simulation Request' button at the bottom left of screen. The user will be shifted to the 'All Simulations' screen and after a short period of time the user will be able to download their results under the 'download' column. The results will again be in a zipped file and will have the same format as the base results already discussed.

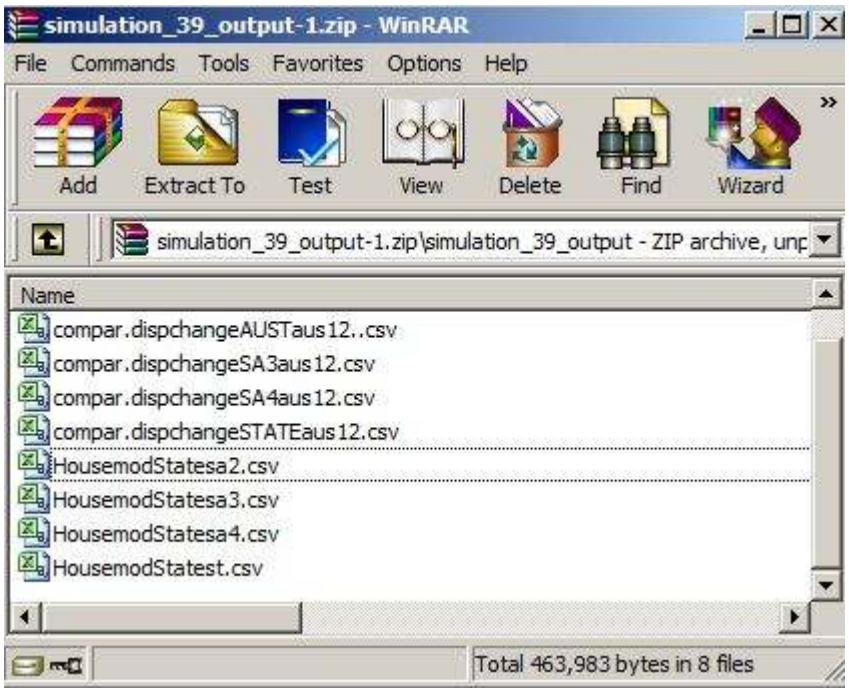
<u>Compare Simulation</u>

Under the compare simulation runtype the user can only adjust the mortgage rate and the CRA parameters. All analysis is undertaken for 2012-13 financial year and all economic and demographic parameters are set to their default values.

Upon setting parameters the user can submit their simulation using the submit button. Results will be provided through the same process as the simulation described in the previous section.

Two sets of results will be provided. The first will be in the same format as the simulation and base results already described. These files 'HousemodStatesa2.csv and other similar files for other regional geographies provide the same format of

results as per the base and simulation. The additional csv files with a ‘compare.dispchange’ prefix provide the distributional winners and losers information.



For each region the number of households that are winners, losers and ‘no change’ are listed along with the mean impact for all households. For example, for a given simulation for 2012 the table below shows that for ‘purchaser’ households there were 98,483 households that were ‘losers’, and 2,738,795 households that were ‘no change’ households. No households were ‘winners’. The mean impact on purchaser families was an average $pa loss of disposable income of $48. Further results are also provided for households of different income levels (income quintiles), and family type variable.

	A	B	C	D	E
1	Household Outcome	Owner Occupier	Purchaser	Public Housing	Private Rent
2	losers	78532	98483	11772	418302
3	mean_impact $pa	-62	-48	-20	-910
4	no change	2574647	2738795	414358	1060207

Mapping Housemod data through AURIN portal

Housemod does not directly map results. To map the results the user can either use their own mapping software or use the AURIN portal. The AURIN portal provides a very simple facility to upload external data which can then be mapped and further analysed within the portal. The Housemod output data includes the necessary geographic code to enable mapping and analysis. The user will need to ensure a few

simple steps are taken when copying and pasting to a new csv or excel file to ensure that the data is in a format suitable for mapping within the AURIN portal.

1) Ensure that the data imported is for a single year only
2) The data includes the geographic code as a column
3) The data includes the variables of interest for mapping
4) The data includes only one record per geography. This would mean that data with three columns 'winner', 'loser' and 'no change' for a given SA2/3/4 would not be appropriate. The user will need to create different spreadsheets for each class of household type.

For a full explanation of the AURIN portal and mapping and analysis within the portal the following webpage should be read in detail. http://docs.aurin.org.au/

For a very quick guide follow these steps:

1) Log into the AURIN portal
2) Under 'Data' click on the 'import' button and import your csv file from Housemod
3) Under 'Visualise' click 'maps, charts and graphs'
4) Click on 'Map Visualisations' and then 'Cloropeth' (as an example)
5) Click on your data that you downloaded and select the attribute you wish to map and then set up the map as you desire.
6) Click down the bottom on 'Add & Display'

Your Housemod data should now be mapped.

For further information
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